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The Assistant Commissioner of Patents  
Washington, DC 20231

Sir:

Transmitted herewith for filing is the patent application of :

Applicant: Roger Q. Smith

For: Heavy-Duty Audio Equipment

Enclosed are:

- X Specification including 20 claims
- 3 Sheets of drawings

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Respectfully submitted,

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## HEAVY-DUTY AUDIO EQUIPMENT

### Field of the Invention

This invention relates generally to audio equipment and, more  
5 particularly, to heavy-duty radios.

### Background of the Invention

It is well known that audio equipment, such as portable radios, are  
taken to construction sites, so that the construction workers can listen to music,  
10 talk shows, etc., while working. However, the audio equipment may be  
destroyed at the jobsite because tools may be dropped on them. Similarly, the  
equipment may fall from a table, etc., resulting in damage thereto.

It is therefore an object of this invention to provide an audio  
equipment that can withstand the rigors of a jobsite.

15

### Summary of the Invention

In accordance with the present invention, an improved audio  
equipment is employed. The audio equipment includes a housing, audio circuitry  
installed within the housing, and at least one protective bar flexibly connected to  
20 the housing. Preferably, a handle may be attached to the protective bar.

Additional features and benefits of the present invention are  
described, and will be apparent from, the accompanying drawings and the  
detailed description below.

Brief Description of the Drawings

The accompanying drawings illustrate preferred embodiments of the invention according to the practical application of the principles thereof, and in which:

5           FIG. 1 is a front elevational of an audio equipment according to the present invention;

          FIG. 2 is a rear elevational view of the audio equipment of FIG. 1;

          FIG. 3 is a side elevational view of the audio equipment of FIG. 1;

          FIG. 4 is a cross-sectional view along line IV-IV of FIG. 3;

10           FIG. 5 is a block diagram of the circuitry of the audio equipment of FIG. 1; and

          FIG. 6 is a cross-sectional view along line VI-VI of FIG. 2.

Detailed Description

15           The invention is now described with reference to the accompanying figures, wherein like numerals designate like parts. Referring to FIGS. 1-3, an audio equipment component, such as radio 10, of the present invention comprises a housing 11. Housing 11 may support the radio circuitry (not shown), the speakers 12 connected to the radio circuitry, the volume, tuning and switch  
20   knobs (15, 16 and 17 respectively), antenna 14, and auxiliary input jack 13.

          Preferably speakers 12 and part of housing 11 are coated with a waterproof coating, such as a rubber coating or paint. Alternatively, other waterproofing schemes may be used for protecting the speakers 12. For

example, US Patent Nos. 3,391,754, 2,829,728, and 2,517,138 disclose appropriate waterproofing schemes and are hereby incorporated by reference.

The knobs may also comprise waterproofing means for impeding entry of water into housing 11. Such means may include walls created on the  
5 housing 11 and/or the knobs, creating a labyrinth passage for water.

Alternatively, other waterproofing schemes may be used for the knobs. For example, US Patent Nos. 3,391,754, 3,277,739, 2,502,915 and 1,162,793 disclose appropriate waterproofing schemes and are hereby incorporated by reference.

10 Antenna 14 is preferably constructed of a flexible material, allowing antenna 14 to bend without breaking.

Preferably, at least one protective bar 20 is flexibly connected to the housing 11. Such bar 20 is may be made of aluminum, or other suitable material. Preferably, the bar 20 is made of a plastic, such as ABS or  
15 polypropylene. The bar 20 may be injection-molded. Alternatively, the plastic may be injected into a mold (preferably about half the volume needed to complete fill the mold and thus filling half of the mold), then air or gas is blown therein, pushing the plastic into the other half of the mold, forming a hollow tube. This process is known as gas-assist injection molding.

20 Preferably, two bars 20 are formed in respective loops and are connected to a respective side of housing 11. A handle 21 may be fixedly attached to the bars 20 via, e.g., screws (not shown). Preferably, the shape of bars 20 and handle 21 is such that the housing 11 cannot be contacted by

anything wider than the handle 21 and/or bars 20. Such construction minimizes the risk of damage to housing 11.

As mentioned above, the bars 20 may be flexibly connected to the housing. Such connection is achieved via the connector assemblies 30.

5 Referring to FIG. 4, a connector assembly 30 is disposed between the bar 20 and housing 11. The connector assembly 30 comprises a flexible gasket 31, which is preferably made of a flexible, resilient material such as rubber or an elastometer. The gasket 31 may be connected to the bar 20 via a screw 34 threadedly engaging a nut 35. The gasket 31 in turn may be connected to the  
10 housing 11 via a screw 32 threadedly engaging a nut 33. Gasket 31 may be molded over screw 32 and/or nut 35. Such construction minimizes the shock received by housing 11, and thus by the circuitry mounted within, when radio 10 is dropped.

Referring to FIGS. 2 and 6, housing 11 may also have a door 19  
15 pivotally attached thereto, providing access to receptacle assembly 50 and allowing an operator to install a battery pack 60 within housing 11. The door 19 may be kept in a closed position by latch 18. Preferably, latch 18 comprises an overcenter mechanism.

Preferably, receptacle assembly 50 is designed to receive a battery  
20 pack 60 via a connector 56. The connector 56 has a configuration appropriate to contact the battery terminals. Preferably the battery pack terminals and connector 56 will be arranged in the manner disclosed in U.S. Patent No. 5,144,217, which is hereby incorporated by reference.

The charger circuitry 43 may be fixedly connected to both connector 56 and receptacle assembly 50. Connector 56 preferably disposed on a floating receptacle housing 55, to minimize the shock received by the battery pack 60 and the circuitry 43 if the radio 10 is dropped.

5           The receptacle housing 55 may be flexibly connected to the housing 11 via a flexible gasket 51. Preferably, gasket 51 is generally annular and made of a flexible, resilient material, such as rubber or elastometer.

10           Retainers 52 may be installed on housing 11 to prevent the disengagement of gasket 51 and housing 11 when pushing the battery pack 60 in place. Retainers 52 may be attached to housing 11 via screws 53 and may have a generally annular form. Retainers 52 may also prevent the removal of receptacle housing 55 when removing the battery pack 60 by providing a stopping surface which would contact the charger circuitry board 43.

15           A spring 54 may also be provided on door 19 to bias battery pack 60 into connection with connector 56. Preferably spring 54 will be flexible enough to bias battery packs having different sizes.

FIG. 5 is a block diagram of the circuitry within housing 11. Charger circuitry 43 is connected to a power supply 40. Power supply 40 may receive power from an alternating current source via connector 41 and/or from  
20   charger 43. In addition, power supply 40 provides power to charger 43 in order to charge battery pack 60.

Power supply 40 also provides power to radio circuitry 44. A switching means 42 may be connected to switch knob 17 to properly select the

components receiving power. For example, the user can select if the power supply 40: (a) provides power to both the radio circuitry 44 and to charger 43 (for charging battery pack 60); (b) provides power to the radio circuitry 44 from the battery pack 60; (c) provides no power to any component; etc. Switching  
5 means 42 may comprise relays, transistors or other switching devices as is well known in the art.

Radio circuitry 44 may comprise three main modules: (a) radio tuner 45 for receiving and demodulating the radio signal received via antenna 14; (b) amplifier 46 connected to tuner 45 for amplifying the demodulated radio  
10 signal; and (c) speakers 12 connected to amplifier 46 for converting the amplified signal into audible signals. Amplifier 46 may also amplify signals received from an auxiliary input 13, allowing a user to play a separate cassette deck or compact disk player through the radio 10. Persons skilled in the art should recognize that the specific circuitry for each component is well known in the art.

15 Preferably charger 43 is shielded with a metal covering, such as lead, copper, gold, etc., so as to not affect the receipt, processing and/or amplification of the radio signal. Similarly, charger 43 can be provided with induction coils, or other types of filters, so as to minimize the effect of the charger on the radio signal, etc.

20 Persons skilled in the art may recognize other alternatives to the means disclosed herein. However, all these additions and/or alterations are considered to be equivalents of the present invention.

**CLAIMS**

What is claimed is:

5

1. An audio equipment comprising:  
a housing;  
audio circuitry installed within the housing; and  
a first protective bar flexibly connected to the housing.

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2. The equipment of Claim 1, further comprising a handle attached to the first protective bar.

15

3. The equipment of Claim 1, further comprising a connector assembly flexibly connecting the first protective bar to the housing.

4. The equipment of Claim 3, wherein the connector assembly comprises a flexible gasket.

20

5. The equipment of Claim 4, wherein the flexible gasket is disposed between the first protective bar and the housing.

6. The equipment of Claim 1, further comprising a second protective bar flexibly connected to the housing.

25



7. A method of manufacturing an audio equipment, comprising:  
making a housing;  
providing a first protective bar;  
flexibly connecting the first protective bar to the housing.

5

8. The method of Claim 7, further comprising installing audio circuitry  
installed within the housing.

9. The method of Claim 7, further comprising attaching a handle to the  
10 first protective bar.

10. The method of Claim 7, wherein connecting the first protective bar to  
the housing comprising providing a connector assembly between the first  
protective bar and the housing.

15

11. The method of Claim 10, wherein the connector assembly comprises  
a flexible gasket.

12. The method of Claim 7, further comprising flexibly connecting a  
20 second protective bar to the housing.

13. The method of Claim 7, wherein the first protective bar is injection-  
molded.

14. The method of Claim 7, wherein the first protective bar is made using the gas-assist injection molding process.

15. An electronic equipment comprising:  
5 a main housing; and  
a receptacle assembly for receiving a battery flexibly connected to the main housing.

16. The equipment of Claim 15, wherein the receptacle assembly  
10 comprises a receptacle housing and a flexible gasket disposed between the receptacle housing and the main housing.

17. The equipment of Claim 16, wherein the receptacle assembly further  
comprises at least one retainer disposed on the housing to prevent  
15 disengagement of the gasket.

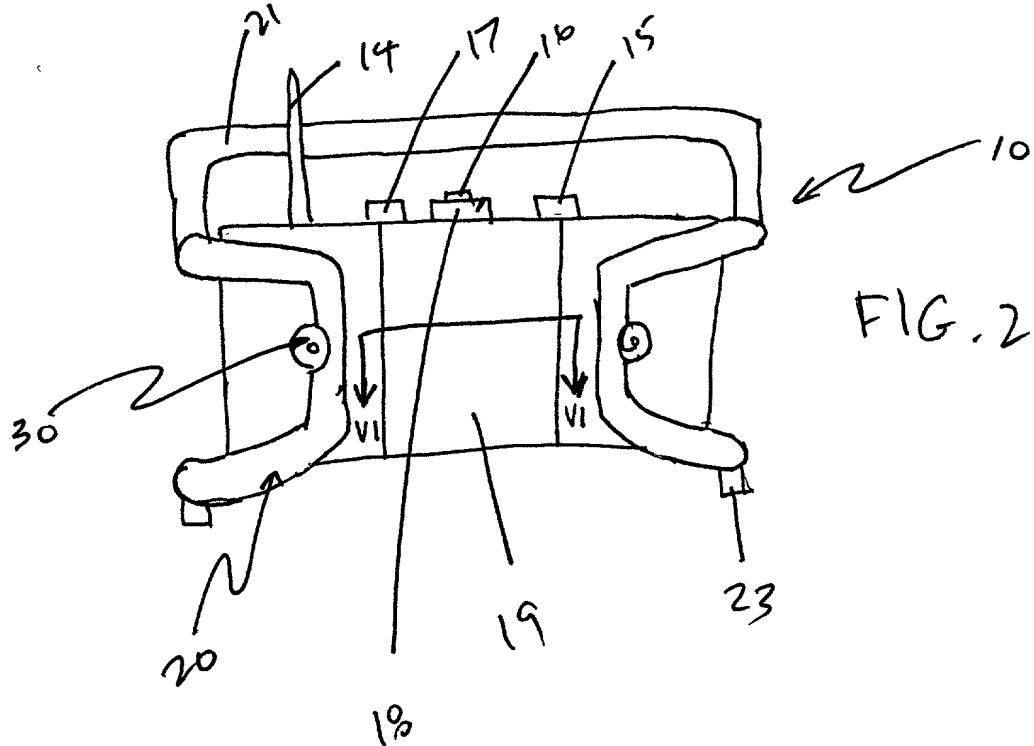
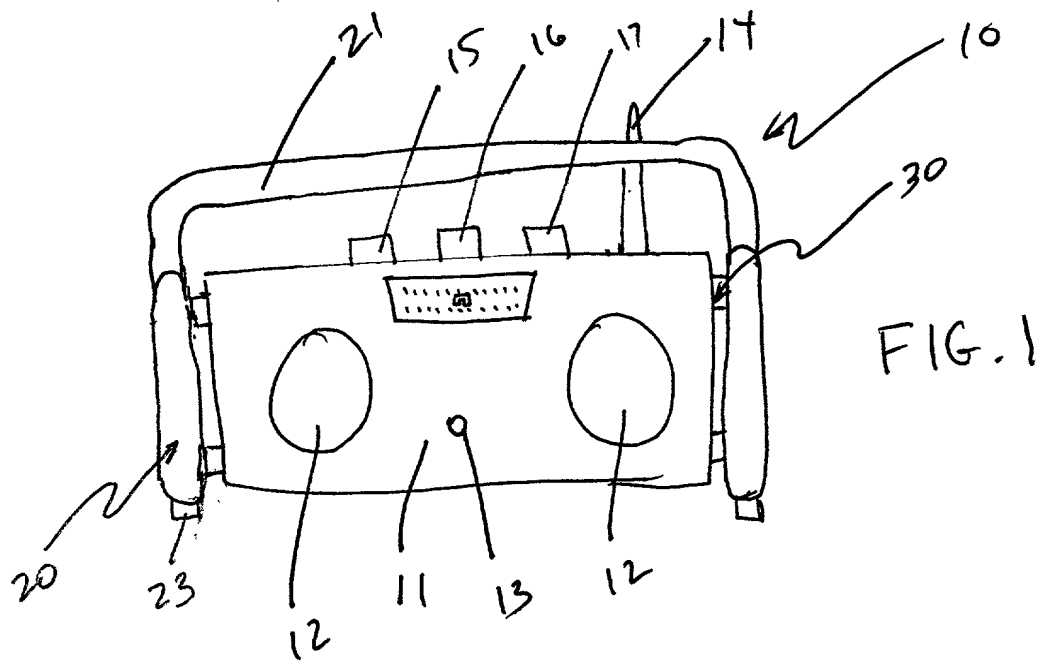
18. The equipment of Claim 16, wherein the gasket is made of rubber or elastometer.

20 19. The equipment of Claim 15, further comprising a door hingably connected to the main housing and opposite of the receptacle assembly.

20. The equipment of Claim 18, wherein the door has a spring disposed thereon to bias a battery disposed in the receptacle assembly towards a connecting position.

**ABSTRACT**

In accordance with the present invention, an improved audio equipment is employed. The audio equipment includes a housing, audio circuitry installed within the housing, and a first protective bar flexibly connected to the housing. The audio equipment may also include a handle attached to the first protective bar, a second protective bar flexibly connected to the housing, and/or a connector assembly flexibly connecting the first protective bar to the housing. The connector assembly may include a flexible gasket preferably disposed between the first protective bar and the housing. Also disclosed herein is a method for manufacturing an audio equipment.



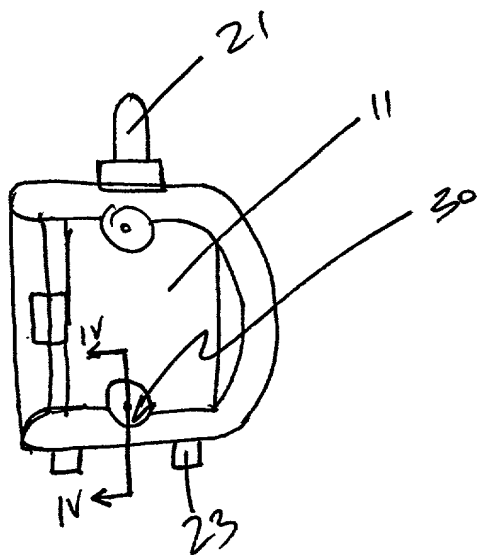


FIG. 3

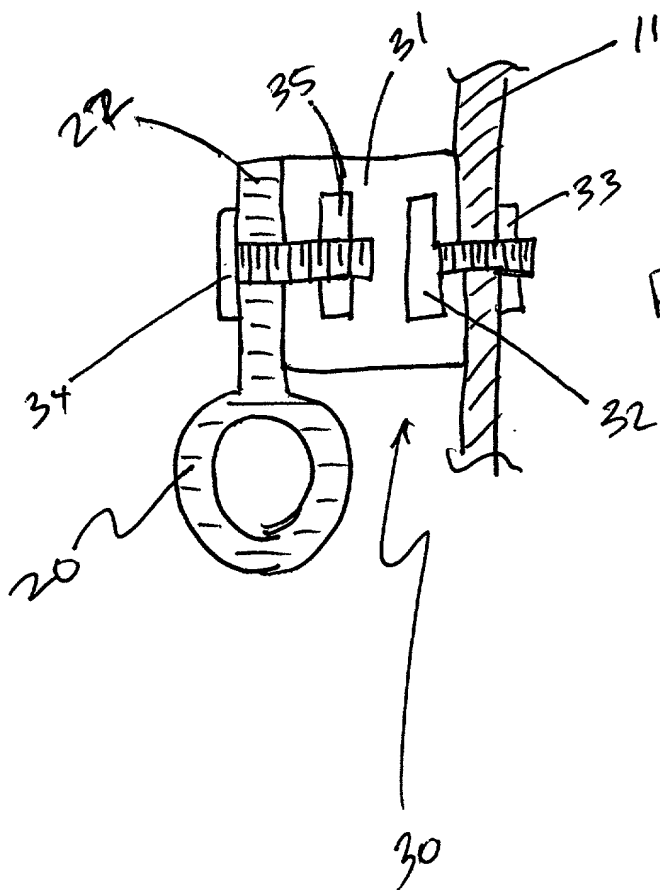
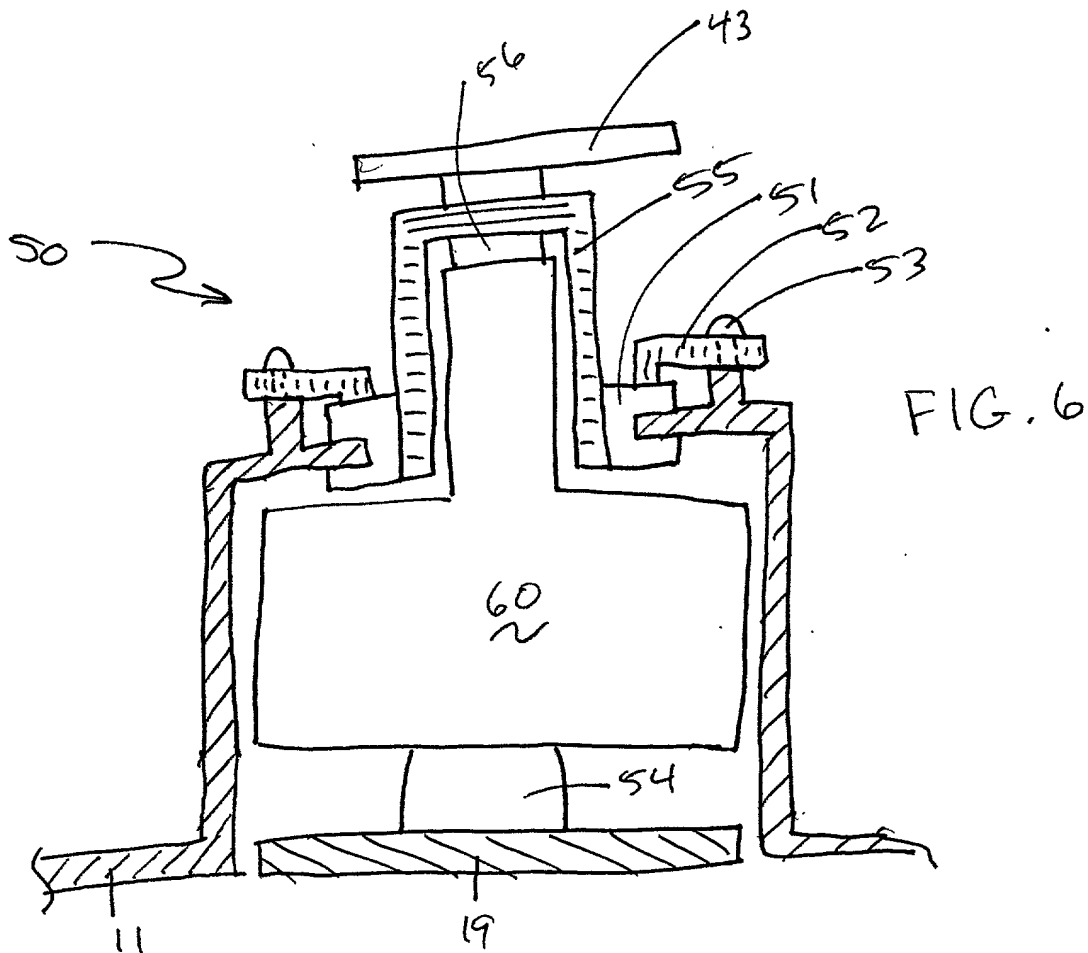
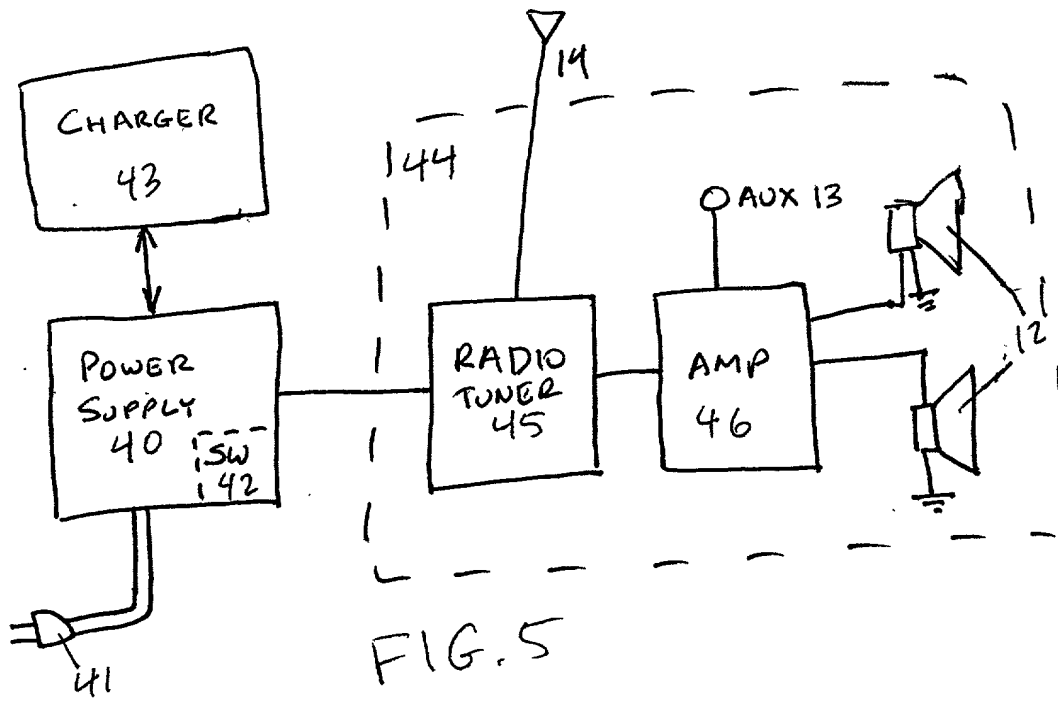
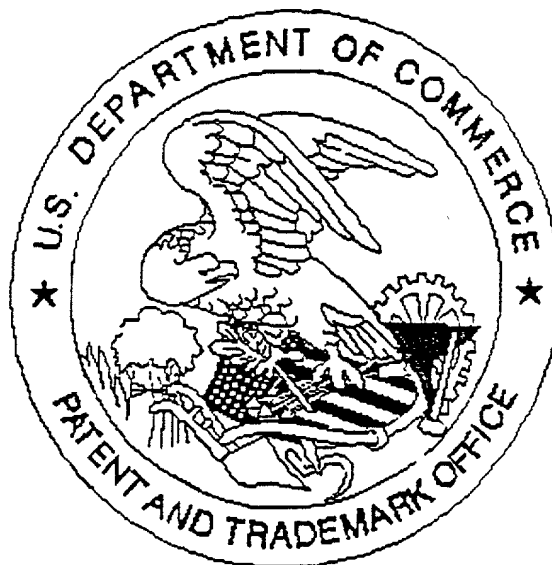


FIG. 4



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